

4. Chronometrics and Mineral Identification by R. M. Farquhar

The preliminary studies (April 1975) of element concentrations in bone samples from the Old Crow area have been continued. A suite of fossil specimens displaying the range of staining observed in fossil bones from this region was provided by Dr. E. Beebe, from the NYRP project collection. As a first step in the analysis only unfractured bones were sampled to provide a depth sequence for neutron activation. Samples represented material from increasing depth in approximately 1 mm steps (near bone surfaces) or 2 mm steps (near bone interiors). Care was taken in the drilling process to avoid contaminating samples from depth with surface material. The drilling was undertaken using steel end-mills of various diameters, so that depths in each drilling stage could be reasonably well defined. The first group of samples were irradiated in the SLOWPOKE nuclear reactor with thermal neutrons for three minutes at a reactor power of two kilowatts. Elements determined were Co, U, Dy, Sm, Eu, Ba, Sr, La, Mg, Na, V, K, Al, Mn, Cl, Ca. A preliminary examination of the results confirms the observations of the earlier study. Uranium and the rare earths Sm and Eu, in most of the samples, show a decrease in concentration with depth followed by a rise as the interior of the bone is approached. Fig. 1 and 1A demonstrate this. In spite of the fact that the bones analysed were unfractured, these elements are entering the solid parts of the bone from inside and outside. There are interesting exceptions to this as Fig. 2 and 3 show.

Manganese, vanadium, and barium exhibit, less clearly, a similar variation with depth. For the fossil bones, manganese contents are two orders of magnitude higher than that in modern bone from the area. The outer surface concentrations of this element varied by up to a factor of three in the fossil bones analysed. Several soil samples taken from the vicinity of one of the bones, were analysed to determine the concentration of elements in the matrix surrounding the specimens.

6. Chronometrics and Mineral Identification by R. M. Farquhar

The preliminary studies (April 1975) of element concentrations in bone samples from the Old Crow area have been continued. A suite of bison humerus displaying the range of staining observed in fossil bones from this region was provided by Dr. B. Beebe, from the NYRP project collection. As a first step in the analysis only unfractured bones were sampled to provide a depth sequence for neutron activation. Samples represented material from increasing depth in approximately 1 mm steps (near bone surfaces) or 2 mm steps (near bone interiors). Care was taken in the drilling process to avoid contaminating samples from depth with surface material. The drilling was undertaken using steel end-mills of various diameters, so that depths in each drilling stage could be reasonably well defined. The first group of samples were irradiated in the SLOWPOKE nuclear reactor with thermal neutrons for three minutes at a reactor power of two kilowatts. Elements determined were Co, U, Dy, Sm, Eu, Ba, Sr, La, Mg, Na, V, K, Al, Mn, Cl, Ca. A preliminary examination of the results confirms the observations of the earlier study. Uranium and the rare earths Sm and Eu, in most of the samples, show a decrease in concentration with depth followed by a rise as the interior of the bone is approached. Fig. 1 and 1A demonstrate this. In spite of the fact that the bones analysed were unfractured, these elements are entering the solid parts of the bone from inside and outside. There are interesting exceptions to this as Fig. 2 and 3 show.

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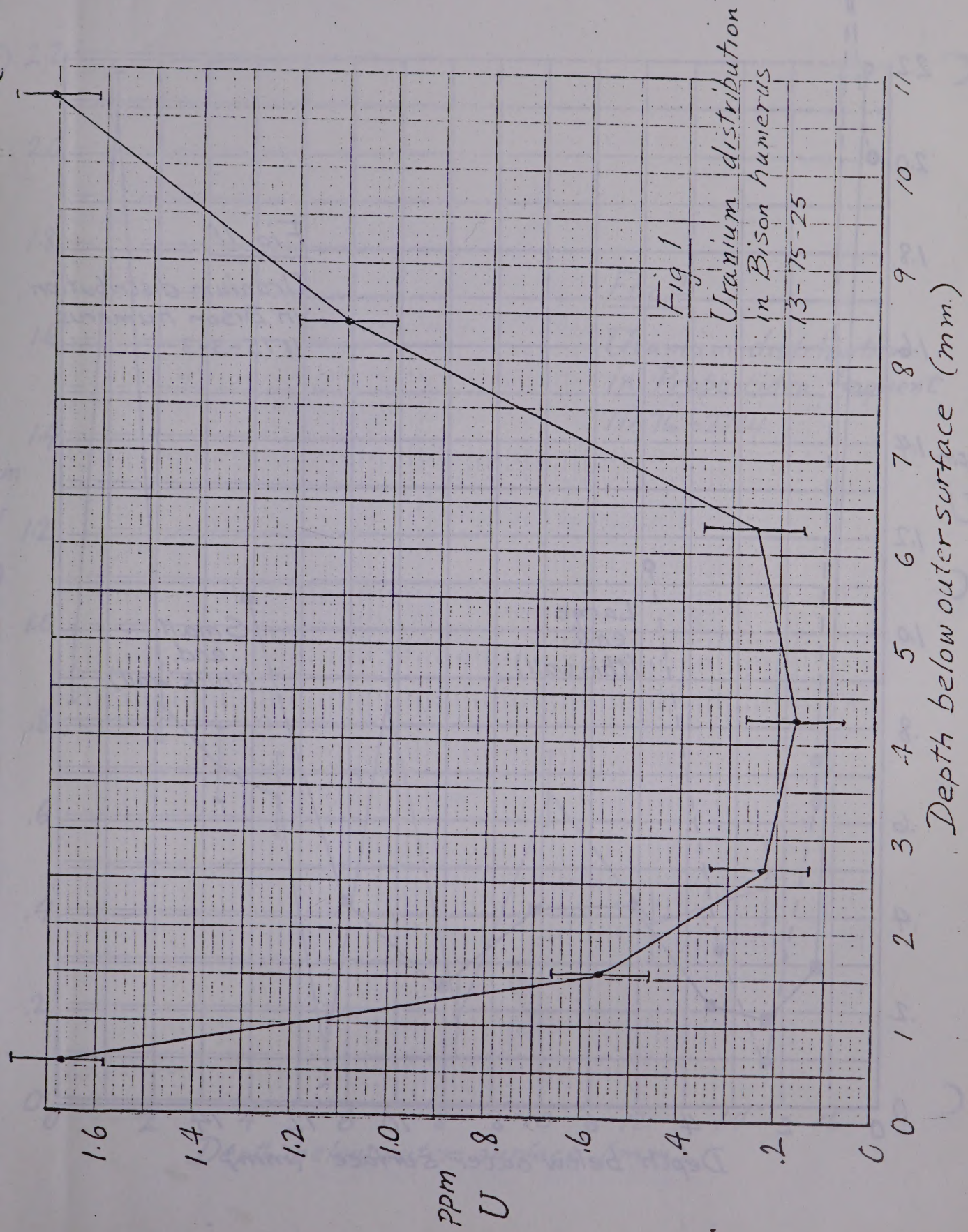
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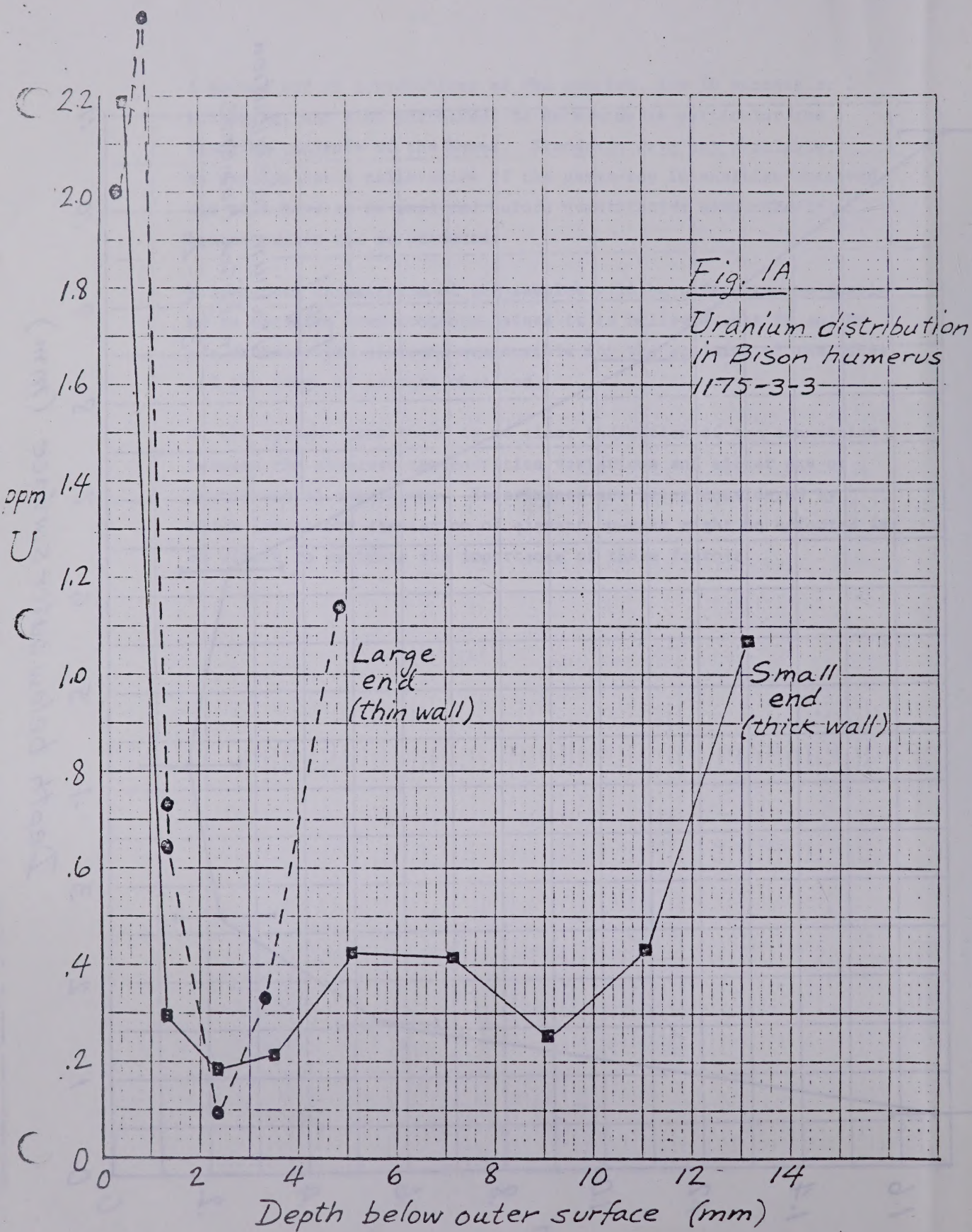
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A second set of irradiations of the samples, for 10 seconds at 2 kilowatts, was also performed, to determine in particular the fluorine contents of the bones. Standards were not available to provide for a calibration of the gamma-ray intensities observed, and will have to be analysed before quantitative measurements of concentration can be produced.

A long term irradiation of the samples will be undertaken to enable us to estimate iron contents, since it is believed that Fe and Mn are probably the elements responsible for the staining of the bones, and the range of colours observed.

At the present time there is no clear indication of the connection between the observed concentration variations and either age or environmental conditions. Experiments are being considered by which laboratory simulation of element up-take might be effected in an effort to estimate the importance of these factors.





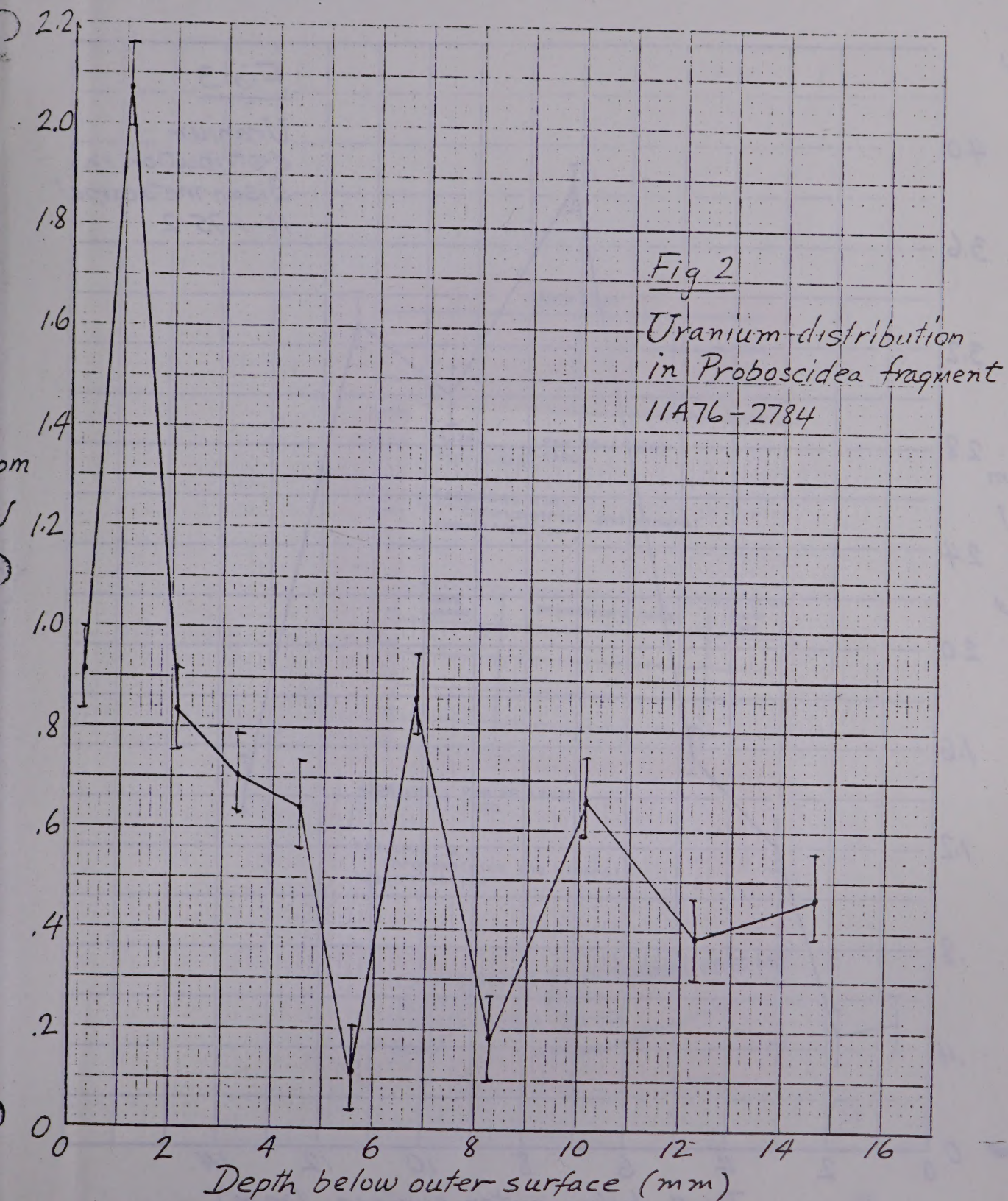
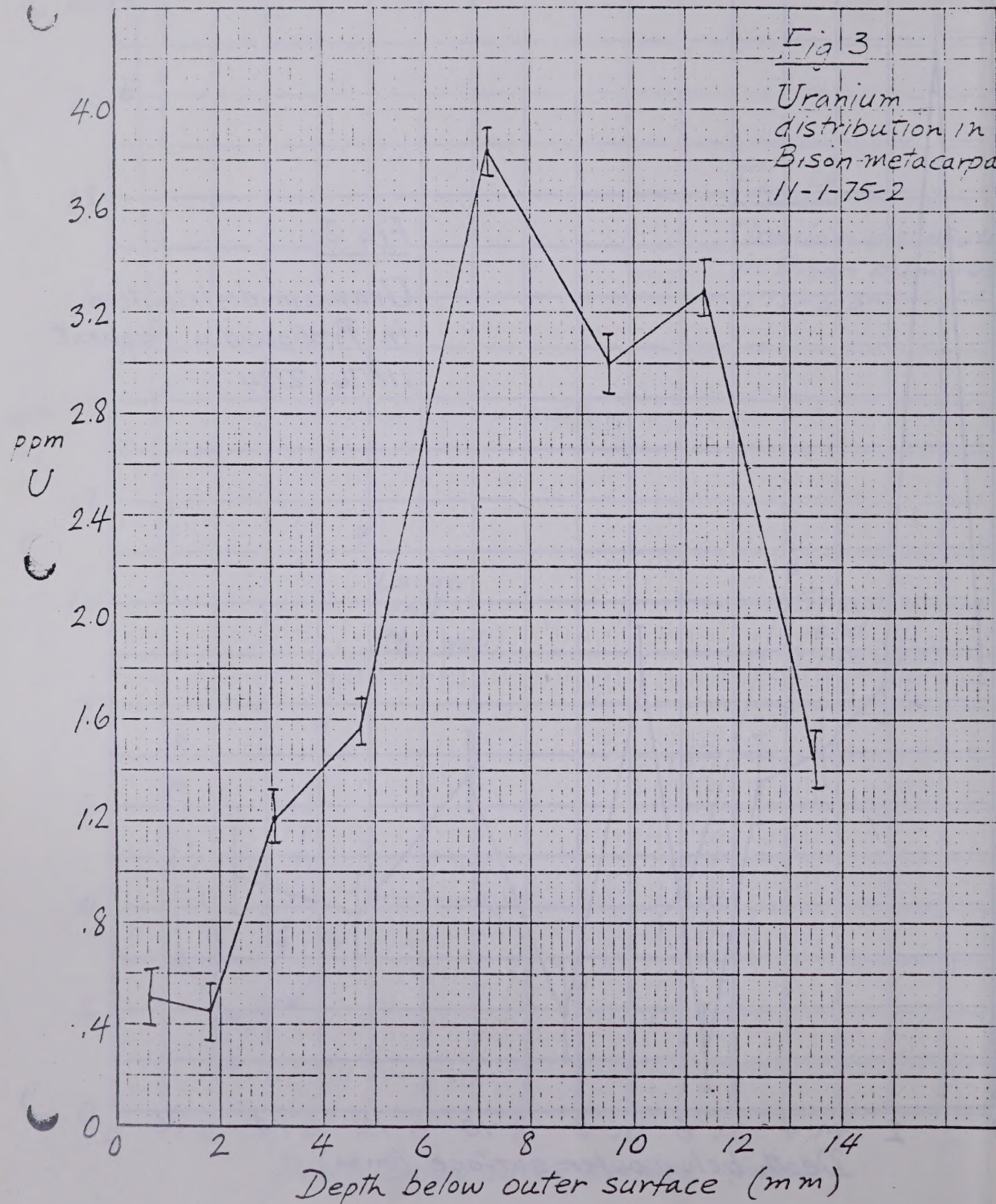


Fig 3

Uranium
distribution in
Bison metacarpal
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